

## **Xenoestrogen exposure and altered reproductive timing in Puget Sound English sole**

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Vitellogenin, a yolk protein produced in the liver of oviparous animals in response to estrogens, normally occurs only in sexually mature females with developing eggs. However, males can synthesize vitellogenin when exposed to environmental estrogens, making the abnormal production of vitellogenin in male animals a useful biomarker for xenoestrogen exposure. As part of the Puget Sound Ambient Monitoring Program, we surveyed English sole from a number of Puget Sound sites for evidence of xenoestrogen exposure, using vitellogenin production in males as an indicator. Significant levels of vitellogenin were found in male fish from several urban sites, with especially high numbers of fish affected in Elliott Bay. To better understand how exposure to estrogenic substances is affected fish health, we monitored reproductive development in male and female English sole throughout the 2002-2003 spawning season. At the Elliott Bay sites where abnormal vitellogenin production has been observed in male sole, female English sole are entering vitellogenesis earlier in the season than sole from other sites, and final egg maturation and spawning appear to be delayed. Female sole also appear to be maturing at a smaller size and younger age at Elliott Bay sites than at other reference sites in Puget Sound.